EC–F CHASSIS "MINI-MANUAL" TECHNICAL INFORMATION

73E261261-6 IMPORTANT – SAFETY INFORMATION

THE CHASSIS OF THIS RECEIVER IS 70 VOLTS AC ABOVE EARTH GROUND. USE AN ISOLATION TRANSFORMER TO POWER THE RECEIVER WHILE PERFORMING SERVICE.

AFTER SERVICING THE RECEIVER, PERFORM THE FOLLOWING SAFETY CHECK.

A. Connect the VHF antenna to the VHF antenna terminals.
B. Do not plug the receiver into a power outlet. Connect both blades of the power plug together and place the ON-OFF switch in the ON position.
C. Measure between the shorted power plug and the following points. Readings should be as indicated.

TEST POINT	MIN. OHMS	MAX. OHMS
ANTENNA TERMINALS – UHF	600K	5.2 MEGS
ANTENNA TERMINALS – VHF	600K	5.2 MEGS
CABINET BACK SCREWS	OPEN CIRCUIT	
ALL METAL CONTROL OR CHANNEL SELECTOR SHAFTS (WITH KNOBS REMOVED)	OPEN CIRCUIT	
ALL NON-REMOVABLE METALLIC KNOBS, PUSH BUTTONS, EARPHONE JACKS, ETC.	OPEN CIRCUIT	
METAL ESCUTCHEONS AND OVERLAYS	OPEN CIRCUIT	

IF ANY READING IS OUTSIDE LIMITS SPECIFIED, THE CAUSE SHOULD BE IDENTIFIED AND CORRECTED BEFORE OPERATING THE RECEIVER.

ADJUSTMENT PROCEDURE

HIGH VOLTAGE

Normal high voltage is approximately 28.5KV at zero beam (black picture) with 120 VAC line input. Not adjustable.

HIGH VOLTAGE SHUT DOWN CIRCUIT CHECK

PERFORM WHENEVER HIGH VOLTAGE CIRCUITRY OR POWER SUPPLY BOARD IS SERVICED

1. Set the brightness control to maximum and read DC voltage from TP902 to ground. The voltage should read between -2.0 and -3.0 volts.
2. Short TP901 to TP902. High voltage must shut down. Test points are at the top of the power supply module.
3. Remove short, turn set off and then back on.
4. Set should operate normally.

THE CAUSE FOR ANY DEVIATIONS FROM NORMAL NOTED IN STEPS 1 AND 2 ABOVE MUST BE IDENTIFIED AND CORRECTED BEFORE OPERATING THE RECEIVER.

AGC ADJUSTMENT

1. Tune in a strong station. Set Picture Control to mid position and adjust brightness control for normal viewing.
2. Set IF AGC to mid position. This is normally the optimum setting for this control.
3. Turn RF AGC fully CW. Then turn CCW slowly until a point is reached where no overload or noise is present in the picture.

AFC ADJUSTMENT (On Sets with conventional tuners only)

1. Tune in a strong station with color.
2. Defeat AFC by holding in the Fine Tuning Knob. Adjust for best picture with knob "in".
3. Release Fine Tuning Knob and note any change in picture detail. If necessary, adjust L121 so that detail is nearly equal. Check all channels.

APC ADJUSTMENT

1. Tune in a color picture. Adjust Brightness, Picture Control, and Color Controls for a normal picture.
2. Short TP33, 34 and 35 to each other. These are located in a 3 pin male connector on the board to the left of the large Chroma IC (IC300).
3. Adjust the APC Control a the top of the large signal board until colors float by or stop.
4. Remove short from test points.

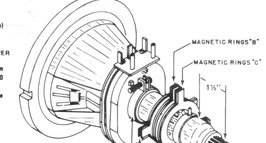
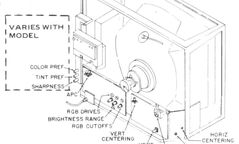


FIGURE 1



STEP 1 PURITY

1. Degauss and allow receiver to warm up at least 10 minutes before adjusting for purity. The convergence/purity magnet assembly should be secured 1½ inch from the tip of the CRT pins (See Figure 1). The convergence at the picture center should be set approximately correct. See Step # 2.
2. Disconnect PGS (Coax. to signal bd.). Turn Blue Red, and Green Cutoff controls fully CCW. Turn brightness fully CW. Adjust Brightness Range, R271, until raster is just cut off. Adjust Red Cutoff control CW for red raster.
3. Slide deflection yoke back. Set purity rings so that the squared tab and the rounded tab are together and horizontal. Separate the tabs to center the red Ger (See Figure 2). Do not rotate the rings as this will cause a vertical movement of the red bar.
4. Slide the deflection yoke forward to obtain a pure red field.
5. Turn Red Cutoff control fully CCW, and, one at a time, turn up the Blue and Green Cutoff controls to check the purity of the blue and green fields. Reconnect PGS and, if necessary, repeat adjustments for best compromise. Secure the yoke clamp.

STEP 3 DYNAMIC CONVERGENCE

1. Use a crosshatch pattern.
2. Insert a wedge between the CRT and yoke at position A (Figure 3) for horizontal splits (Figure 4).
3. If it is necessary to correct for vertical splits (Figure 5) readjust the wedge slightly for best compromise.
4. For edge convergence insert a wedge in position B or E (Figure 3). If the blue is high (Figure 6) insert a wedge in position B. If the red is high (Figure 7) insert a wedge in position E.
5. To "lock" the dynamic convergence:
   A. If the second wedge was inserted in position B, insert the third wedge in position D.
   B. If the second wedge was inserted in position E, insert the third wedge in position C.
   C. Confirm that dynamic convergence remains properly aligned and lock each wedge in position with a strip of tape.

STEP 4 GRAY SCALE AND BRIGHTNESS CENTERING

1. Tune in a color picture, set the Brightness, Picture, Color, Red, Green, Blue Cutoff controls and screen control, R178 1, fully CCW. Set R, G, B Drive Controls and Brightness Range, R271, fully CW.
2. Turn the VIR. off. Place black tape over Light Sensor (not on all models).
3. Disconnect the vertical yoke plug, PG9. Short TP40 on signal board to ground. Adjust Green Screen Control CW until raster line lights. Then turn it CCW until the line just goes black. Disconnect the short from TP40.
4. Turn Brightness fully CW. Turn Brightness Range CCW until first gen just lights. Adjust Red, Blue, and Green Cutoff controls to just illuminate the line. Connect vertical yoke plug, PG9.
5. Turn Picture Control and Brightness Range up for normal picture. Adjust the Drive Control of the predominate color for best gray scale in the high brightness areas.
6. Readjust Cutoff controls for low brightness areas. Repeat as necessary. Remove tape from Light Sensor opening.
7. Brightness Range – Turn the Brightness control fully CW and the Picture control fully CCW. Turn the Brightness Range so that the black areas in the picture are slightly gray.

POWER SUPPLY

When power is switched on, four things happen:

1. **Degaussing takes place.**
2. The +120 volt regulator system charges up and begins regulating. +120 volts is supplied to the horizontal output transistor.
3. The start-up capacitor (C956) is charged up by the +120V DC regulated power supply voltage and produces +46 volts on the +47 volt output terminal for use by the buffer stage.
4. +13 is divided down by R913 from the +47 volt terminal and fed to the sweep board to start the horizontal and vertical oscillator systems.

The above sequence will develop high voltage.

Once high voltage is developed, all scan supplies start up. When the +47 volt scan supply starts up, it will take over the buffer and +13 volt loads.

AC line rectified B plus voltage is supplied to the horizontal output transistor circuit (+120). All other circuits are powered by scan supplies.

STEP 2 STATIC CONVERGENCE

GREEN GUN IS THE CENTER GUN. CONVERGE THE RED AND BLUE. THEN CONVERGE RED AND BLUE ON GREEN.

1. VERTICAL CONVERGENCE BLUE & RED — MAGNET RING "B" SEE FIG 1 — Slide magnetic tabs toward or away from each other
2. HORIZONTAL CONVERGENCE BLUE & RED — MAGNET RING "B" SEE FIG 1 — Rotate both magnetic rings together
3. VERTICAL CONVERGENCE BLUE & RED ON GREEN — MAGNET RING C SEE FIG 1 — Slide magnetic ring tabs toward or away from each other
4. HORIZONTAL CONVERGENCE BLUE & RED ON GREEN — MAGNET RING C SEE FIG 1 — Rotate both magnetic rings together
5. REPEAT STEP 1 AND 2, IF ALL LINES ARE NOT CONVERGED AT CENTER

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

FIGURE 6

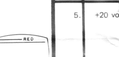


FIGURE 7

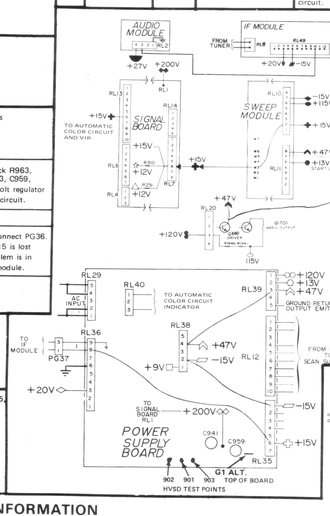
SERVICE HINTS

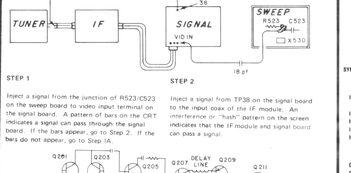
1. First step in Troubleshooting is to check power supply voltages. CAUTION: Do not permit volt meter probe to short to adjacent pins. Damage will result.
2. Suspect problems in high voltage transformer windings that supply scan circuit or problems in scan circuits. Disconnect RL12 and apply power to receiver. The set will develop high voltage and have a pulsating/flickering raster indicating +120 circuit and start-up circuit are O.K.
3. No video, may not have raster. Determine if problem is in tuner, IF, or signal board by signal injection. See step 1A.
4. Vertical output problems. If Q807 is shorted, R608 or R610 will exhibit evidence of overheating. If R608 or R610 are O.K. then suspect Q809.
5. When working in power supply, check base of Q2903 for -29.7 volts. If voltage reads too high or too low, suspect problems with Q2903 and surrounding circuitry. Q905 should provide +15 volts. It higher (17 or 18 volts), Q905 may be shorted.
6. The +120 volts source and +15 volts source both have independent current shutdown circuiting. If short exists, the appropriate source will read zero volts. When the short is removed, voltage will automatically be restored.

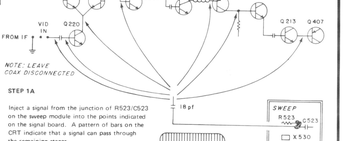
TROUBLESHOOTING INFORMATION

ITEM	POWER SUPPLY VOLTAGES	VOLTAGE READING	SYMPTOM	CHECK
1.	+120 volts	RL39 Pin 1 135V	No high voltage No +13 volts	Q2903 and PSR circuit
2.	+47 volts	RL39 Pin 3 OV Pulsatin +47V	No high voltage No high voltage	Disconnect PG39 and PG38, apply power. Is 47V restored: If it has, check Q580 and its circuit. If power is not restored, check Y957, R957, Q963. Check Sweep Module, R957 and Y957.
3.	+13 volts	RL39 Pin 2 OV Pulsatin +13V	No high voltage No high voltage	Check items 1 and 2, then check R913, C1703, (open) and HVSD module. Check item 2. Pulsating +47 Volts.
4.	+15 volts	RL-35 Pin 6 0 volts	No raster No audio High voltage O.K.	Disconnect PG35 and PG36. Is +15 volts restored? Yes → Reconnect PG35, is +15 lost: Yes → Disconnect PG7. Is +15 restored: No → Problem on sweep module. / No → Problem on signal board. / No → Check R963, Y963, Q959, 15 volt regulator and circuit. / Yes → Reconnect PG36. If +15 is lost problem is in IF module.
5.	+20 volts	RL36 Pin 3 OV	No audio	Disconnect PG36. If voltage at pin 3 is still 0, check R963, Y963, Q959 and check continuity of copper pattern between positive side of Q959 and pin 3 of RL36. +20 is supplied only to the audio module.
6.	-15 volts	RL-35 Pin 1 OV	Used to switch bands in tuner. Also used for vertical cent.. Without this voltage, vert. centering will not work properly.	Disconnect PG38 and PG35. Check R975, Y975, C971 and continuity between pins 1 of RL35 and pin 2 of RL38. Monitor voltage at pin 1 of RL35 and reconnect PG38. Is voltage O.K.? If not, problem is in tuner circuit. If O.K., monitor pin 2 of RL38 and re-connect PG35. Is voltage O.K.? If not, check -15 on sweep board.

ITEM	POWER SUPPLY VOLTAGES	VOLTAGE READING	SYMPTOM	CHECK
7.	+200 volts	RL-1 OV	Bright raster with retrace. No brightness control.	Disconnect PG 1 and check R979, Y979 and C977. Replace defective component, apply power and check for +200 volts. Reconnect PG-1 and check for +200 volts. If voltage not present, check for shorts in Q401, Q403, and Q405.
8.	+9 volts	RL-38 Pin 1 OV	Noise/snow on screen. Audio from one strong channel may be heard on several channels.	Disconnect PG38 and check R969, Y969 and C965. Replace defective component and apply power. Do you have +9V on pin 1 of RL38. If so, reconnect PG38 and check pin 1 again. If voltage is not present, a short exists in tuner circuit.




18pf
TUNER
IF
TEST POINT 38
SIGNAL
SWEEP
R523 C523
X530
VID IN
18pf
STEP 1
Inject a signal from the junction of R523/C523 on the sweep board to video input terminal on the signal board. A pattern of bars on the CRT indicates a signal can pass through the signal board. If the bars appear, go to Step 2. If the bars do not appear, go to Step 1A.
STEP 2
Inject a signal from TP38 on the signal board to the input coax of the IF module. An interference or "hash" pattern on the screen indicates that the IF module and signal board can pass a signal.
STEP 1A
Inject a signal from the junction of R523/C523 on the sweep module into the points indicated on the signal board. A pattern of bars on the CRT indicate that a signal can pass through the remaining stages.
BAR PATTERN
Brightness and contrast at maximum — may require adjustment of the brightness centering if raster is dim.
APPROX 2.5 BARS



REPLACEMENT PARTS LIST

MODULES AND CIRCUIT BOARDS

* P.S.R. Module	EP62X110
* H.V.S.D. Module	EP62X111
IF Aud. Module	EP93X217
Signal Module	EP93X235
Sweep Module	EP93X295
Power Supply Module	EP93X281
Audio Module	EP93X266

INTEGRATED CIRCUITS

SYMBOL	CAT. NO.	DESCRIPTION
IC110	EP84410	IC, AFC, AFC.
IC120	EP8435	IC, AFC.
IC190	EP8422	IC, Audio
IC300	EP84335	IC, Chroma Processor
IC501	EP84382	IC Countdown

TRANSISTORS

Q132	EP15X88	Transistor, NPN, AGC Amp
Q140	EP15X54	Transistor, NPN, 3rd IF
Q154	EP15X54	Transistor, NPN, 4th IF
Q179	EP15X88	Transistor, NPN, Video E.F.
Q200	EP15X88	Transistor, NPN, VIR Video Driver
Q201	EP15X88	Transistor, NPN, Differential Amp
Q203	EP15X88	Transistor, NPN, Differential Amp
Q205	EP15X88	Transistor, NPN, Peaking Amp.
Q207	EP15X88	Transistor, NPN, Video Amp.
Q209	EP15X40	Transistor, PNP, Video Amp.
Q210	EP15X88	Transistor, NPN, Beam Limiter
Q211	EP15X88	Transistor, NPN, Video Follower
Q212	EP15X40	Transistor, PNP, Beam Limiter
Q213	EP15X88	Transistor, NPN, Video Follower
Q220	EP15X88	Transistor, NPN, Video Amp.
Q260	EP15X88	Transistor, NPN, Pulse Follower
Q262	EP15X88	Transistor, NPN, D.C. Restorer
Q280	EP15X88	Transistor, NPN, Video Blanking Gate
Q340	EP15X88	Transistor, NPN, Chroma Emitter Follower
Q360	EP15X88	Transistor, NPN, D.C. Tint Control
Q401	EP15X81	Transistor, NPN, Red Output
Q402	EP15X81	Transistor, NPN, Green Output
Q405	EP15X81	Transistor, NPN, Blue Output
Q407	EP15X88	Transistor, PNP, Video Driver
Q505	EP15X88	Transistor, NPN, Noise Gate
Q510	EP15X88	Transistor, NPN, Sync Separator
Q540	EP15X87	Transistor, NPN, Pulse Inverter
Q545	EP15X88	Transistor, NPN, Sync Speed-Up
Q580	EP15X19	Transistor, NPN, Horiz. Driver
Q601	EP15X85	Transistor, NPN, Vert. Amp.
Q603	EP15X88	Transistor, NPN, Vert. Amp.
Q605	EP15X87	Transistor, NPN, Vert. Driver
Q905	EP15X87	Transistor, NPN, 15V. Regulator
D1701	EP15X46	Transistor, NPN, H. Output
Q2901	EP15X25	PNP, Silicon
Q2902	EP15X24	PNP, Silicon
Q2903	EP15X88	Transistor, NPN, Vert. Output
Q2907	EP15X105	Transistor, NPN, Vert. Output
Q2909	EP15X105	Transistor, NPN, Vert. Output
Q2903	EP15X108	Transistor, NPN, 120V. Regulator

CRYSTALS

X330	EP41X10	Crystal, Quartz
X330	EP41X53	Crystal, Ceramic Resonator

DIODES

Y170	EP18X3	Diode, Video Det.
Y177	EP18X27	Diode, Clamp
Y183	EP18X3	Diode, Audio D.t.
Y184	EP18X3	Diode, Audio Det.
Y290	EP87X4	Diode, Rectifier
Y712	EP18X27	Diode, Clamp
Y233	EP87X4	Diode, Rectifier
Y280	EP18X27	Diode, Clamp
Y281	EP18X27	Diode, Clamp
Y283	EP18X27	Diode, Clamp
Y284	EP18X27	Diode, Clamp
Y287	EP18X58	Diode, Zener
Y350	EP18X27	Diode, Silicon
Y372	EP18X27	Diode, Silicon
Y381	EP18X58	Diode, Zener
Y384	EP18X58	Diode, Zener
Y387	EP18X58	Diode, Zener
Y407	EP18X27	Diode, Silicon
Y502	EP18X27	Diode, Silicon
Y507	EP18X27	Diode, Silicon
Y510	EP87X4	Diode, Rectifier
Y901	EP18X27	Diode, Silicon
Y903	EP18X27	Diode, Silicon
Y904	EP18X11	Diode, Rectifier
Y906	EP18X27	Diode, Silicon
Y907	EP87X4	Diode, Rectifier
Y909	EP87X4	Diode, Rectifier
Y911	EP87X4	Diode, Rectifier
Y913	EP87X4	Diode, Rectifier
Y915	EP87X4	Diode, Rectifier
Y941	EP87X4	Diode, Rectifier
Y903	EP87X4	Diode, Rectifier
Y906	EP87X4	Diode, Rectifier
Y907	EP87X4	Diode, Rectifier
Y910	EP87X4	Diode, Rectifier
Y943	EP18X27	Diode, Silicon
Y944	EP18X27	Diode, Silicon
Y951	EP87X4	Diode, Rectifier
Y953	EP18X52	Diode, Zener
Y956	EP87X4	Diode, Rectifier
Y957	EP87X5	Diode, Rectifier
Y958	EP87X4	Diode, Rectifier
Y960	EP87X4	Diode, Rectifier
Y963	EP87X5	Diode, Rectifier
Y980	EP87X5	Diode, Rectifier
Y975	EP18X11	Diode, Rectifier
* Y977	EP87X10	Diode, Rectifier
* Y978	EP87X10	Diode, Rectifier
Y979	EP87X5	Diode, Rectifier
Y991	EP87X4	Diode, Rectifier
T1701	EP18X11	Diode, Damper
Y1703	EP18X24	Diode, Clamp
Y1800	EP87X5	Diode, Fuse Rect.

RESISTORS

* R20	EP1432X1	1.8 Meg 10%, ½W
* R21	EP1432X1	1.8 Meg 10%,½W
* R31	EP1432X7	3.3M, 5%, ½W
* R23	EP1432X7	3.3M 5%, ½W
* R402	EP1432X31	12K, 5%, 2W
* R433	EP1432X31	12K, 5%, 2W
* R403	EP1432X31	12K, 5% 2W
* R610	EP1432X80	10 ohm, 5%, 1W
* R645	EP1432X98	2 ohm, 5%, ½W
* R917	EP1432X43	2.2K, 5%, ½W
* R933	EP1432X43	2 ohm, 10%, 4W
* R957	EP1432X32	2.2 ohm, 5%, 2W
* R963	EP1432X32	2.2 ohm, 5%, 2W
* R969	EP1432X80	2.2 ohm, 5%, ½W
* R975	EP1432X77	100 ohm, 5%, ½W
* R979	EP1432X80	2.2 ohm, 5%, ½W
* R991	EP1432X83	2.2 ohm, 5%, ½W
R1703	EP1432X83	68K, 5%, 2W
* R1707	EP1432X82	1.8K, 5%, 1W
* R1709	EP1432X38	2000, Fuse Control Part of T1700
* R1711	Part of T1700	
* R1713	EP1432X80	680 ohm, 5%, ½W
* R1727	EP1432X52	1 ohm, 5%, 2W
* R1802	EP1432X14	100 ohm, 10%, 5W
* R1949	EP1432X43	4 ohm, 10%, 5W
* R1941	EP1432X43	5 ohm, 5%, 10W
* R2902	EP1432X13	Depending Thermistor
* R2903	EP1432X18	2.7 ohm, 10%, 10W
* R2930	EP1432X86	56 ohm, 5%, 10W
* R2931	EP1432X86	56 ohm, 5%, 10W

COILS AND TRANSFORMERS

*	EP37X42	Ant. Bracket
*	EP8X36	Anode Connector-CRT
*	EP34X50	Socket-CRT
		Ground with wires
* L2003	EP3E857	Choke, Filter
* L8901	EP3E3A80	Degaussing Coil
* T1500	EP64X38	Buffer Transformer
* T1700	EP77X43	H.V. Transformer
* T1800	EP78X28	Yoke
* T1810	EP3EX315	Pin Cushion
* T5198	EP64X40	STORK, Audio Output

MISCELLANEOUS

* EP37X42	Ant. Bracket
* EP8X36	Anode Connector-CRT
* EP34X50	Socket-CRT
	Ground with wires
* J2001	EP1E319 Fuse, 4 amp, Fast Acting
* J2002	EP1E319 Fuse, 1½ amp, Fast Acting
* J5190	EP8X40 Earphone Jack

CAPACITORS

* C20	EP1E3217	470pf, 20%, 125V
* C21	EP1E3217	470pf, 20%, 125V
* C22	EP1E3217	470pf, 20%, 125V
* C23	EP1E3217	470pf, 20%, 125V
* C28	EP1E3217	470pf, 20%, 125V
* C818	EP2E518	27uf, 200V, Electrolytic
* C1703	EP25X90	.015mf, 5%, 1.2KV
* C1709	EP1E3132	820pf, 10%, 500V
* C2902	ES2ZX4	.01uf, 20%, 125VAC
* C2923	EP1E3E87	220uf, 180V, Electrolytic
* C2925	EP2E3108	10uf, 150V, Electrolytic

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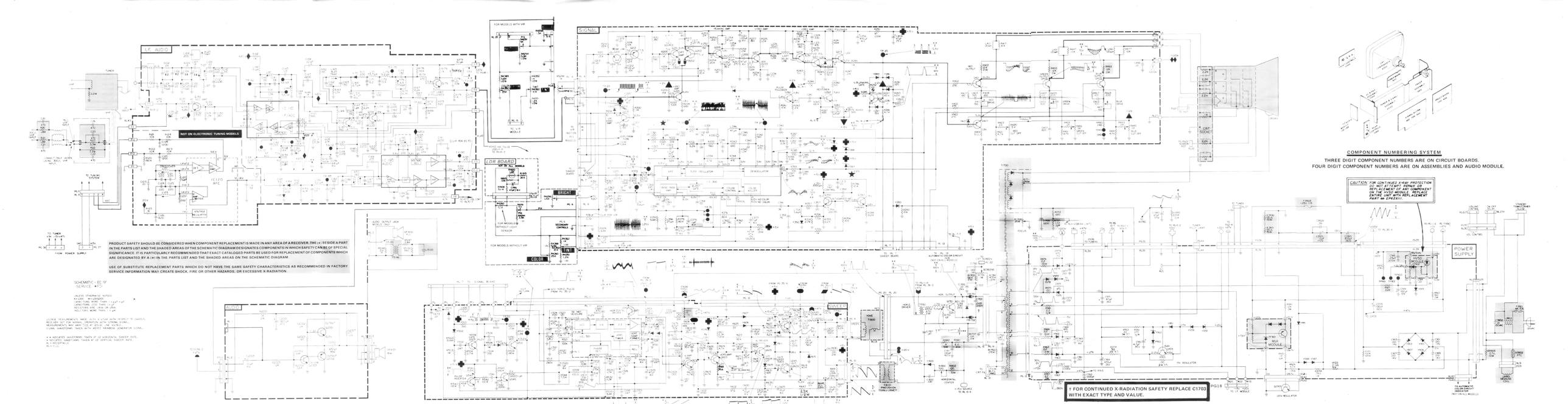
I.F. AUDIO
SIGNAL
LDP BOARD
AUDIO
DEFLECTION
POWER SUPPLY
NOT ON ELECTRONIC TUNING MODELS
FOR MODELS WITH VIR
FOR MODELS WITHOUT VIR
FOR MODELS WITHOUT LIGHT SENSOR
BRIGHT
TINT
COLOR
TO TUNER
FROM POWER SUPPLY
TO TUNING SYSTEM
TO SIGNAL BOARD
TO DEFLECTION
TO AUDIO
TO CRT SOCKET
TO CRT
TO SPEAKER
TO AUTOMATIC DEGAUSSING INDICATOR (NOT ON ALL MODELS)
TO VIR MODULE
TO I.F. MODULE
TO VOL CONTROL
TO TUNER
TO AUDIO
TO SIGNAL BOARD
TO DEFLECTION